Designation: B88M – 16

Standard Specification for Seamless Copper Water Tube (Metric)[1]

This standard is issued under the fixed designation B88M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers seamless copper water tube suitable for general plumbing, similar applications for the conveyance of fluids, and commonly used with solder, flared, or compression-type fittings. The type of copper water tube suitable for any particular application is determined by the internal or external fluid pressure, by the installation and service conditions, and by local requirements. Means of joining or bending are also factors that affect the selection of the type of tube to be used.[2]

NOTE 1—Annealed tube is suitable for use with flared or compression fittings, and with solder-type fittings, provided rounding and sizing of the tube ends is performed where needed.

NOTE 2—Drawn temper tube is suitable for use with solder-type fittings. Types A and B tube, in the drawn temper, are suitable for use with certain types and sizes of compression fittings.

1.2 The tube shall be produced from the following coppers, and the manufacturer has the option to supply any one of them, unless otherwise specified:

Copper UNS No.	Previously Used Designation	Description
C10200	OF	Oxygen free without residual deoxidants
C12000	DLP	Phosphorus deoxidized, low residual phosphorus
C12200	DHP	Phosphorus deoxidized, high residual phosphorus

1.3 The assembly of copper plumbing or fire sprinkler systems by soldering is described in Practice B828.

1.4 Solders for joining copper potable water or fire sprinkler systems are covered by Specification B32. The requirements for acceptable fluxes for these systems are covered by Specification B813.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 3—This specification is the SI companion to Specification B88.

1.6 The following safety hazards caveat pertains only to the test methods portion, Section 15, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards:*[3]

B32 Specification for Solder Metal

B88 Specification for Seamless Copper Water Tube

B153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing

B577 Test Methods for Detection of Cuprous Oxide (Hydrogen Embrittlement Susceptibility) in Copper

B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B813 Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube

B828 Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings

B846 Terminology for Copper and Copper Alloys

B900 Practice for Packaging of Copper and Copper Alloy Mill Products for U.S. Government Agencies

E8/E8M Test Methods for Tension Testing of Metallic Materials

E18 Test Methods for Rockwell Hardness of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to

[1] This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.04 on Pipe and Tube.

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[2] The UNS system for copper and copper alloys (see Practice E527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix "C" and a suffix "00." The suffix is permitted to be used to accommodate composition variations of the base alloy.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

Determine Conformance with Specifications
E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry
E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)[4]
E112 Test Methods for Determining Average Grain Size
E243 Practice for Electromagnetic (Eddy Current) Examination of Copper and Copper-Alloy Tubes
E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. Terminology

3.1 *Definitions*—For definitions of terms related to copper and copper alloys, refer to Terminology B846.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *tube, copper water, n*—a seamless copper tube conforming to the particular metric dimensions commercially known as Copper Water Tube and designated as Types A, B, and C.

4. Ordering Information

4.1 Include the following information for material ordered under this specification.

4.1.1 ASTM designation and year of issue (for example, B88M – 03),

4.1.2 Copper UNS No. (not necessary unless a specific copper is desired),

4.1.3 Nominal or standard size (Column 1 of Table 1) and whether Type A, B, or C (Section 3),

4.1.4 Temper (Section 7),

4.1.5 Length (see 11.5),

4.1.6 How furnished: straight or coils,

4.1.7 Quantity (pieces) of each size and type,

4.1.8 In addition, when material is purchased for agencies of the U.S. Government, it shall conform to the Supplementary Requirements as defined herein when specified in the contract or purchase order.

4.2 The following options are available and shall be specified in the contract or purchase order when required:

4.2.1 Tension test (Section 8),

4.2.2 Grain size determination (Section 8),

4.2.3 Expansion test (9.1), and

4.2.4 Microscopical Examination for Hydrogen Embrittlement, Procedure B (9.3.2).

5. Materials and Manufacture

5.1 The material shall be of such quality and purity that the finished product shall have the properties and characteristics prescribed in this specification, and shall be cold worked to size.

5.2 The tube shall be finished by such cold-working and annealing operations as are necessary to produce the required temper and surface finish.

5.3 Tube furnished in coils shall be annealed.

[4] The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Dimensions, Mass, and Tolerances in Diameter and Wall Thickness for Metric Copper Water Tube Sizes
(All tolerances are plus and minus except as otherwise indicated.)

Nominal or Standard Size, mm	Outside Diameter, mm	Average Outside Diameter[A] Tolerance, mm		Wall Thickness and Tolerances, mm						Theoretical Mass, kg/m		
				Type A		Type B		Type C				
		Annealed	Drawn	Wall Thickness	Tolerance[B]	Wall Thickness	Tolerance[B]	Wall Thickness	Tolerance[B]	Type A	Type B	Type C
6	6.0	0.05	0.03	0.80	0.08	0.70	0.07	0.60	[C]	0.117	0.104	0.091
8	8.0	0.05	0.03	0.90	0.09	0.80	0.08	0.60	[C]	0.179	0.162	0.125
10	10.0	0.05	0.03	0.90	0.09	0.80	0.08	0.60	[C]	0.230	0.207	0.158
12	12.0	0.06	0.03	1.2	0.1	0.90	0.09	0.60	0.06	0.364	0.280	0.192
15	15.0	0.06	0.03	1.2	0.1	1.0	0.1	0.70	0.07	0.465	0.393	0.281
18	18.0	0.06	0.03	1.2	0.1	1.0	0.1	0.70	0.07	0.566	0.477	0.340
22	22.0	0.06	0.03	1.6	0.15	1.1	0.1	0.80	0.08	0.917	0.646	0.476
28	28.0	0.07	0.04	1.6	0.15	1.2	0.1	0.90	0.09	1.19	0.903	0.685
35	35.0	0.10	0.04	1.6	0.15	1.4	0.15	1.1	0.1	1.50	1.32	1.05
42	42.0	0.10	0.05	1.8	0.2	1.5	0.15	1.2	0.1	2.03	1.71	1.37
54	54.0	0.10	0.05	2.1	0.2	1.7	0.15	1.5	0.15	3.06	2.50	2.21
67	67.0	0.12	0.05	2.4	0.25	2.0	0.2	1.6	0.15	4.35	3.65	2.94
79	79.0	0.12	0.05	2.8	0.3	2.3	0.25	1.8	0.2	5.99	4.95	3.90
105	105.0	0.12	0.05	3.4	0.35	2.8	0.3	2.4	0.25	9.70	8.04	6.92
130	130.0	0.12	0.05	4.0	0.4	3.1	0.3	2.7	0.25	14.2	11.0	9.65
156	156.0	0.12	0.05	4.8	0.5	3.5	0.35	3.1	0.3	20.3	15.0	13.3
206	206.0	0.15	+ 0.05 −0.10	6.8	0.7	5.0	0.5	4.3	0.45	38.0	28.2	24.4
257	257.0	0.20	+ 0.05 −0.15	8.5	0.85	6.3	0.65	5.4	0.55	59.3	44.4	38.2
308	308.0	0.20	+ 0.05 −0.15	10.3	1.0	7.1	0.7	6.4	0.65	86.1	60.0	54.2

[A] The average outside diameter of a tube is the average of the maximum and minimum outside diameter, as determined at any one cross section of the tube.
[B] Maximum deviation at any one point.
[C] Indicates that the material is not generally available or that no tolerance has been established.

5.4 Tube furnished in straight lengths shall normally be in the drawn temper. Upon agreement between the manufacturer or supplier and the purchaser, the manufacturer shall have the option to supply annealed straight length tubing.

6. Chemical Composition

6.1 The material shall conform to the chemical composition requirements in Table 2 for the specific type of copper.

6.2 These specification limits do not preclude the presence of other elements. When included in the contract or purchase order, and agreed upon by the manufacturer or supplier and the purchaser, limits shall be established and analysis required for unnamed elements.

7. Temper

7.1 The copper water tube shall be furnished in the tempers designated below. Current designations as defined in Classification B601 are as follows:

Annealed-O
Drawn-H

8. Mechanical Properties

8.1 The tube shall conform to the mechanical property requirements prescribed in Table 3. Tension tests and grain size determinations need not be made except when indicated by the purchaser at the time of placing the order. A convenient method of indicating that these tests are to be made is to state that "Test Procedure T is required" (see 4.2.1). Where agreement on the Rockwell hardness tests cannot be reached, the tensile strength and grain-size requirements of Table 3 shall be the basis for acceptance or rejection.

9. Performance Requirements

9.1 *Expansion Test*—The annealed (O) tube shall be capable of being expanded in accordance with Test Method B153 with an expansion of the outside diameter in the following amount:

Nominal or Standard Size, mm	Expansion of Outside Diameter, %
15 and under	40
Over 15	30

The expanded tube shall show no cracking or rupture visible to the unaided eye.

9.2 *Flattening Test*—As an alternative to the expansion test for tube standard sizes 105 mm and over in the annealed condition, a section 100 mm in length shall be cut from the end of one of the lengths for a flattening test. This 100-mm test specimen shall be flattened so that a gage set at three times the wall thickness will pass over the tube freely throughout the flattened part. The tube so tested shall develop no cracks or flaws visible to the unaided eye as a result of this test. In making the flattening test the elements shall be slowly flattened by one stroke of the press.

9.3 *Microscopical Examination for Susceptibility to Hydrogen Embrittlement:*

9.3.1 Tubes furnished in Copper UNS No. C10200 and C12000 shall be essentially free of cuprous oxide as determined by Procedure A of Test Methods B577. When Copper UNS No. C12200 is supplied, examination is not required. In case of a dispute, Procedure C of Test Methods B577 shall be used as the referee method.

9.3.2 Tubes furnished in all coppers shall be capable of passing the embrittlement test specified in Procedure B of Test Methods B577. The actual performance of the test is not required unless specifically requested in the ordering document. In case of a dispute, Procedure C of Test Methods B577 shall be used as the referee method.

TABLE 2 Chemical Composition—Weight %

Element	Copper UNS No.		
	C10200[A]	C12000	C12200
Copper,[B] min	99.95	99.90	99.9
Phosphorus	...	0.004–0.012	0.015–0.040

[A] Oxygen shall be 10 ppm max.
[B] Copper + silver.

10. Nondestructive Testing

10.1 *Eddy-Current Test*—Each tube up to and including 79 mm in outside diameter shall be subjected to an eddy-current test. Testing shall follow the procedure of Practice E243, except the determination of "end effect" is not required. Tubes shall be passed through an eddy current test unit adjusted to provide information on the suitability of the tube for the intended application.

10.1.1 The testing of tube of dimensions beyond the capabilities of the eddy-current test apparatus shall be subject to negotiation between the producer and the purchaser.

10.1.2 Notch-depth standards, rounded to the nearest 0.03 mm, shall be 22 % of the wall thickness. The notch-depth tolerance shall be ±0.01 mm. Alternatively, at the option of the manufacturer using speed insensitive eddy-current units that are equipped to select a fraction of the maximum unbalance signal, the following percent maximum unbalance signals shall be used:

Nominal or Standard Tube Size, mm	Unbalance Signal Magnitude, max %
Up to and incl 12	0.2
15 to 54, incl	0.3
Over 54 to 79, incl	0.4

10.1.3 Tubes that do not actuate the signalling device of the eddy-current testers shall be considered as conforming to the requirements of this test. Tubes with discontinuities indicated by the testing unit shall, at the option of the manufacturer, be reexamined or retested to determine whether the discontinuity is cause for rejection. Signals that are found to have been caused by minor mechanical damage, soil, or moisture shall not be cause for rejection of the tubes provided the tube dimensions are still within the prescribed limits and the tube is suitable for its intended application.

11. Dimensions, Mass, and Permissible Variations

11.1 For the purpose of determining conformance with the dimensional requirements prescribed in this specification, any measured value outside the specified limiting values for any dimensions shall make the tube subject to rejection at the option of the purchaser.

TABLE 3 Mechanical Property Requirements

Temper Designation		Form	Rockwell Hardness[A]		Tensile Strength, min, MPa	Average Grain Size, mm
Standard	Former		Scale	Value		
OS060	annealed	coils	F	50 max	200	0.040 min
OS035	annealed	straight lengths	F	55 max	200	0.025 min
H58	drawn	drawn	30 T	30 min	250	...

[A] Rockwell hardness tests shall be made on the inside surfaces of the tube. When suitable equipment is not available for determining the specified Rockwell hardness, other Rockwell scales and values shall be specified subject to agreement between the purchaser and the supplier.

11.2 *Nominal or Standard Dimensions, Wall Thickness, and Diameter Tolerances*—The nominal or standard dimensions, wall thickness, and diameter tolerances shall be in accordance with Table 1.

11.3 *Mass*—For purposes of calculating mass, cross sections, and so forth, the density of the copper shall be taken as 8.94 g/cm^3. The theoretical mass per metre is shown in Table 1.

11.4 *Roundness*—For drawn unannealed tube in straight lengths, the roundness tolerance shall be as prescribed in Table 4. The deviation from roundness is measured as the difference between major and minor diameters as determined at any one cross section of the tube. No roundness tolerance has been established for annealed tube in straight lengths or for tubes furnished in coils.

11.5 *Lengths and Tolerances:*

11.5.1 *Standard Lengths and Tolerances*—The standard lengths and tolerances shall be as specified in Table 5.

11.5.2 Tube supplied in other than standard lengths and tolerances shall be in accordance with requirements established by agreement between the manufacturer or supplier and the purchaser.

11.6 *Squareness of Cut*—For tube in straight lengths, the departure from squareness of the end of any tube shall not exceed more than 0.25 mm for tube up to and including 15-mm standard size and not more than 0.40 mm/mm of outside diameter for tube larger than 15-mm standard size.

12. Workmanship, Finish, and Appearance

12.1 The material shall be clean, free of dirt and defects of a nature that interfere with normal commercial applications.

13. Sampling

13.1 Sample pieces shall be selected for test purposes from each lot of 5000 kg or fraction thereof, of each size and type, according to the schedule of Table 6.

TABLE 4 Roundness Tolerance

t/D (Ratio of Wall Thickness to Outside Diameter)	Roundness Tolerance % of Outside Diameter (Expressed to Nearest 0.03 mm)
0.01 to 0.03, incl	1.5
Over 0.03 to 0.05, incl	1.0
Over 0.05 to 0.10, incl	0.8

TABLE 5 Nominal or Standard Lengths and Tolerances

Nominal or Standard Size, mm	Type	Nominal or Standard Length, m	Tolerance, mm (all plus)
Tubes Furnished in Straight Lengths			
Up to 206, incl	A, B, C	6.0	25
257	B, C	6.0	25
257	A	5.5	25
308	C	6.0	25
308	B	5.5	25
308	A	3.6	25
Tubes Furnished in Coils			
Up to 28, incl	A, B	20	600
		30	600
35 and 42	A, B	20	600
54	A, B	12	600
		14	600

TABLE 6 Sampling Schedule

Number of Pieces in Lot	Number of Sample Pieces to be Taken[A]
1 to 50	1
51 to 200	2
201 to 1500	3
Over 1500	0.2 % of total number of pieces in the lot but not more than 10 sample pieces

[A] Each sample piece shall be taken from a separate tube.

14. Number of Tests and Retests

14.1 *Chemical Analysis*—Samples for chemical analysis shall be taken in accordance with Practice E255. Drillings, millings, and so forth shall be taken in approximately equal weight from each of the sample pieces selected in accordance with 13.1 and combined into one composite sample. The minimum weight of the composite sample that is to be divided into three equal parts shall be 150 g.

14.1.1 Instead of sampling in accordance with Practice E255, the manufacturer shall have the option of determining conformance to chemical composition as follows: Conformance shall be determined by the manufacturer by analyzing samples taken at the time the castings are poured or samples taken from the semi finished product. If the manufacturer determines the chemical composition of the material during the course of manufacture, he shall not be required to sample and analyze the finished product. The number of samples taken for determination of chemical composition shall be as follows:

14.1.1.1 When samples are taken at the time the castings are poured, at least one sample shall be taken for each group of castings poured simultaneously from the same source of molten metal.

14.1.1.2 When samples are taken from the semi finished product, a sample shall be taken to represent each 5000 kg or fraction thereof, except that not more than one sample shall be required per piece.

14.1.1.3 Because of the discontinuous nature of the processing of castings into wrought products, it is not practical to identify specific casting analysis with a specific quantity of finished material.

14.1.1.4 In the event that heat identification or traceability is required, the purchaser shall specify the details desired.

14.2 *Mechanical Tests*—For the mechanical tests, a specimen shall be taken from each of the sample pieces selected in accordance with 13.1. The required mechanical test shall be made on each of the specimens so selected. The value for the Rockwell hardness number of each specimen shall be established by taking the arithmetical average of at least three readings.

14.3 *Microscopical Examination*—One specimen shall be examined from each of the sample pieces selected in accordance with 13.1.

14.4 In the case of tube furnished in coils, a length sufficient for all necessary tests shall be cut from each coil selected for purpose of tests. The remaining portion of these coils shall be included in the shipment, and the permissible variations in length of such coils shall be waived.

14.5 *Retests:*

14.5.1 If any test specimen shows defective machining or develops flaws, it shall be discarded and another specimen substituted.

14.5.2 If the results of any test made to determine the mechanical properties fail to meet the specified requirements, two additional specimens shall be taken from different sample pieces and tested. The results of the tests on both of these specimens shall meet the specified requirements. Failure of more than one specimen to meet the specified requirements for a particular property shall be cause for rejection of the entire lot.

14.5.3 If the chemical analysis fails to conform to the specified limits, analysis shall be made on a new composite sample prepared from additional pieces selected in accordance with 13.1. The results of this retest shall comply with the specified requirements.

15. Test Methods

15.1 The properties enumerated in this specification shall, in case of disagreement, be determined in accordance with the ASTM methods listed in Table 7.

15.2 *Tension Test:*

15.2.1 Tension test specimens shall be of the full section of the tube and shall conform to the requirements of the section, Specimens for Pipe and Tube, of Test Methods E8/E8M, unless the limitations of the testing machine preclude the use of such a specimen. Use test specimens conforming to type No. 1 of Fig. 13, Tension Test Specimens for Large-Diameter Tubular Products, of Test Methods E8/E8M when a full-section specimen cannot be tested.

TABLE 7 Test Methods

Test	ASTM Designation
Chemical analysis	E53, E62
Tension	E8/E8M (also see 15.2)
Rockwell hardness	E18
Grain size	E112 (also see 15.3)
Expansion (pin test)	B153
Microscopical Examination, Procedure A	B577 (also see 15.3)
Microscopical Examination, Procedure B	B577 (also see 15.3)

15.2.2 Whenever different tension test results are obtained from both full-size and from machined test specimens, the results obtained from full-size test specimens shall be used to determine conformance to the requirements of this specification.

15.2.3 Tension test results on material covered by this specification are not seriously affected by variations in speed of testing. It is not prohibited to use a considerable range of testing speeds; however, the rate of stressing to the yield strength shall not exceed 690 MPa/min. Above the yield strength, the movement per minute of the testing machine head under load shall not exceed 1.27 cm/cm of gage length (or distance between grips for full-section specimens).

15.3 *Grain Size and Microscopical Examination:*

15.3.1 The specimen(s) shall be prepared in accordance with Test Methods E112.

15.3.2 The surface of the test specimen shall approximate a radial longitudinal section of the tube.

16. Significance of Numerical Limits

16.1 For purposes of determining compliance with the specified limits for requirements of the properties listed in Table 8, an observed value or calculated value shall be rounded as indicated in accordance with the rounding method of Practice E29.

17. Inspection

17.1 The manufacturer shall afford the inspector representing the purchaser, all reasonable facilities to satisfy him that the tubes are being furnished in accordance with the specified requirements.

18. Rejection and Rehearing

18.1 Material that fails to conform to the requirements of this specification is subject to rejection at the option of the

TABLE 8 Rounding Units

Property	Rounded Unit for Observed or Calculated Value
Chemical composition Hardness	nearest unit in the last right-hand place of figures of the specified limit
Tensile strength	nearest 5 MPa
Expansion	nearest 1 %
Grain size:	
Up to 0.055 mm, incl	nearest multiple of 0.005 mm
Over 0.055 to 0.160 mm, incl	nearest 0.01 mm

purchaser. Rejection shall be reported to the manufacturer or supplier promptly and in writing. When requested by the manufacturer or supplier, a rehearing shall be granted.

19. Packaging and Package Marking

19.1 The material shall be separated by size, composition, and temper and prepared for shipment in such a manner as to ensure acceptance by common carrier for transportation at the lowest rate applicable and to afford protection from the normal hazards of transportation.

19.2 Each shipping unit shall be legibly marked with the purchase order number, metal or alloy designation, temper, size, total length or piece count, or both, and name of supplier. The specification number shall be shown, when specified.

19.3 *Product Identification:*

19.3.1 The name or trademark of the manufacturer and the mark indicative of the type shall be permanently (incised) marked on each tube at intervals not greater than 0.5 m. Tube in straight lengths shall be further identified throughout its length by a colored marking of Xs, symbol, or logo not less than 4.5 mm in height, including a legend repeated at intervals not greater than 1 m. The legend shall include the type of the tube, name or trademark of the manufacturer, or both, and the country of origin. The manufacturer has the option to include other information.

19.3.2 Colors used shall be green for Type A, blue for Type B, and red for Type C. Such color marking is not applicable to tube furnished in annealed straight lengths or coils.

19.3.3 *UNS Copper Designation:*

19.3.3.1 *Hard Drawn Tubing*—On hard drawn tubing produced from C10200 and C12000, the UNS copper designation shall be identified at intervals not greater than 1 m with color coded ink per 19.3.2.

19.3.3.2 *Annealed Tubing*—On annealed tubing produced from C10200 and C12000, the UNS copper designation shall be identified with ink or some other permanent mark that is repeated at intervals not greater than 1 m. Color marking to distinguish Type A from Type B is not required.

20. Keywords

20.1 copper tube; seamless; UNS No. C10200; UNS No. C12000; UNS No. C12200; water tube

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the inquiry, contract, or order, for agencies of the U.S. Government.

S1. Referenced Documents

S1.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

S1.1.1 *Federal Standards:*[5]

Fed. Std. No. 102 Preservation, Packaging and Packing Levels

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

Fed. Std. No. 146A Tolerances for Copper and Copper Base Alloy Mill Products

Fed. Std. No. 185 Identification Marking of Copper and Copper-Base Alloy Mill Products

S1.1.2 *Military Standards:*[5]

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-129 Marking for Shipment and Storage

S2. Quality Assurance

S2.1 *Responsibility for Inspection:*

S2.1.1 Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all inspection and test requirements specified. Except as otherwise specified in the contract or purchase order, the manufacturer has the option to use his own or any other suitable facilities for the performance of the inspection and test requirements unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification when such inspections and tests are deemed necessary to ensure that the material conforms to the prescribed requirements.

S3. Identification Marking

S3.1 All material shall be properly marked for identification in accordance with Fed. Std. No. 185 except that the ASTM specification number and the alloy number shall be used.

S4. Preparation for Delivery

S4.1 *Preservation, Packaging, Packing:*

S4.1.1 *Military Agencies*—The material shall be separated by size, composition, grade, or class and shall be preserved and packaged, Level A or C, packed, Level A, B, or C, as specified in the contract or purchase order, in accordance with the requirements of Practice B900.

S4.1.2 *Civil Agencies*—The requirements of Fed. Std. No. 102 shall be referenced for definitions of the various levels of packaging protection.

S4.2 *Marking:*

S4.2.1 *Military Agencies*—In addition to any special marking required by the contract or purchase order, marking for shipment shall be in accordance with MIL-STD-129.

S4.2.2 *Civil Agencies*—In addition to any special marking required by the contract or purchase order, marking for shipment shall be in accordance with Fed. Std. No. 123.

[5] Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, http://quicksearch.dla.mil/.

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B88M-13) that may impact its use:

(1) Removed reference to withdrawn Methods E2 (Methods of Preparation of Micrographs of Metals and Alloys (Including Recommended Practice for Photography as Applied to Metallography)).

(2) Removed reference to Guide E3 (Guide for Preparation of Metallographic Specimens) as it is referenced in Test Methods E112.